

# Relationship between habitat and genetics in a wide-ranging large carnivore



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# Legal Status of California Mountain Lions

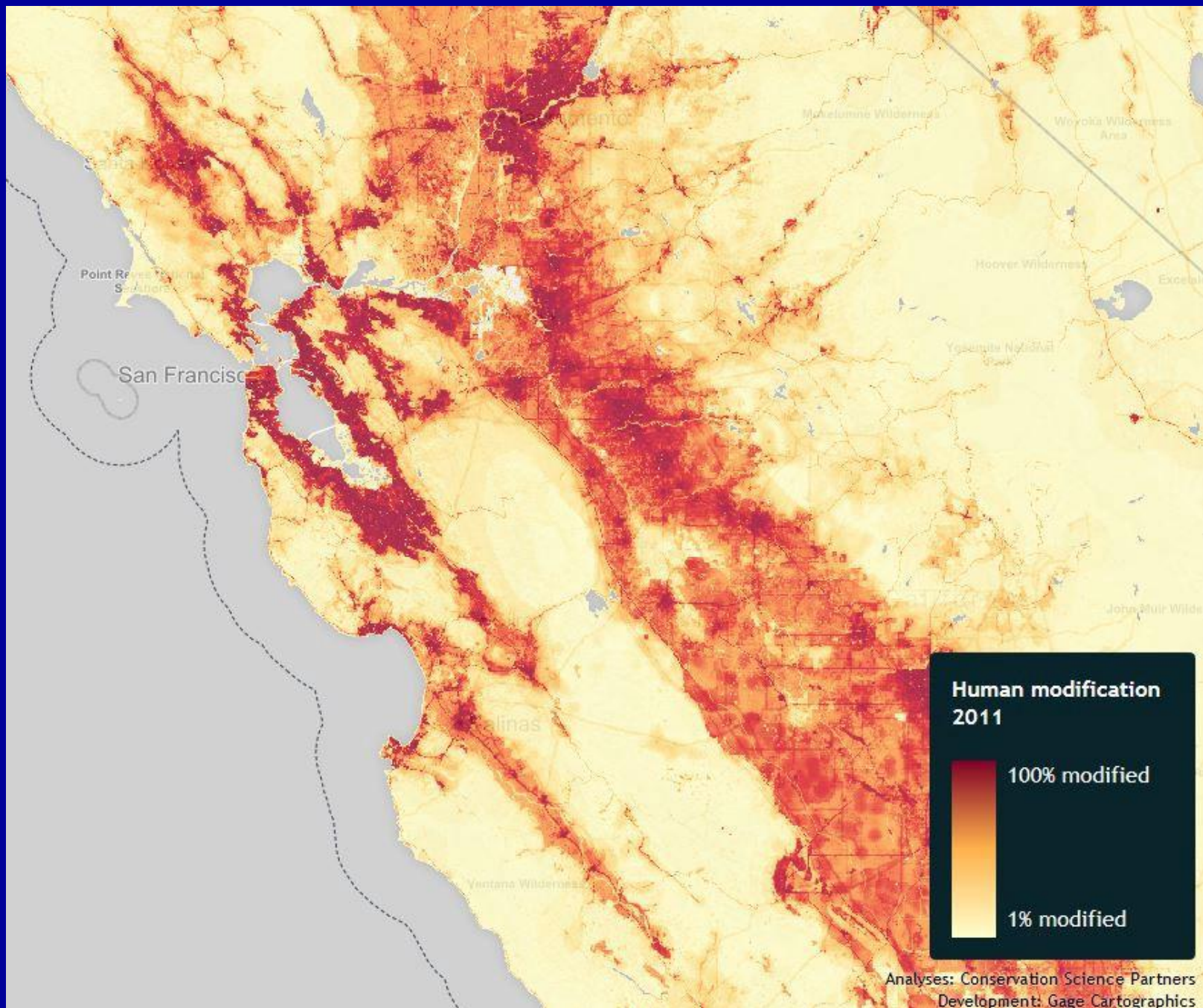
- 1907-1963 Bountied Predator
- 1963-1969 Nongame Mammal
- 1969-1972 Game Mammal
- 1972-1986 Protected Mammal
- 1986-1990 Game Mammal (no hunting)
- 1990-Now Specially Protected Mammal



# Human population growth

Year	Population	% Growth
1900	1,485,053	22.4%
1910	2,377,549	60.1%
1920	3,426,861	44.1%
1930	5,677,251	65.7%
1940	6,907,387	21.7%
1950	10,586,223	53.3%
1960	15,717,204	48.5%
1970	19,953,134	27.0%
1980	23,667,902	18.6%
1990	29,760,021	25.7%
2000	33,871,648	13.8%
2010	37,253,956	10.0%

\*U.S. Census Bureau

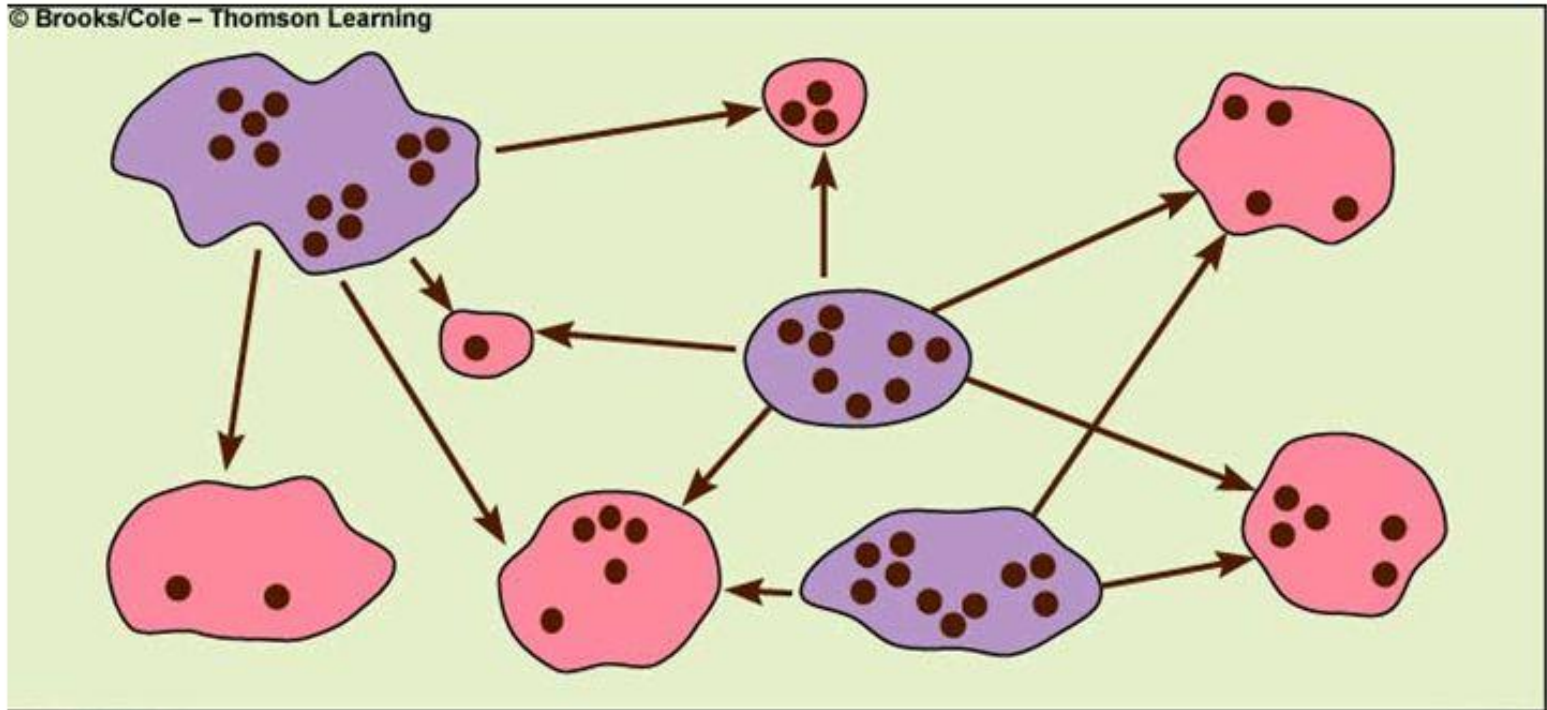












● Source population

● Sink population

● Individual within a local population

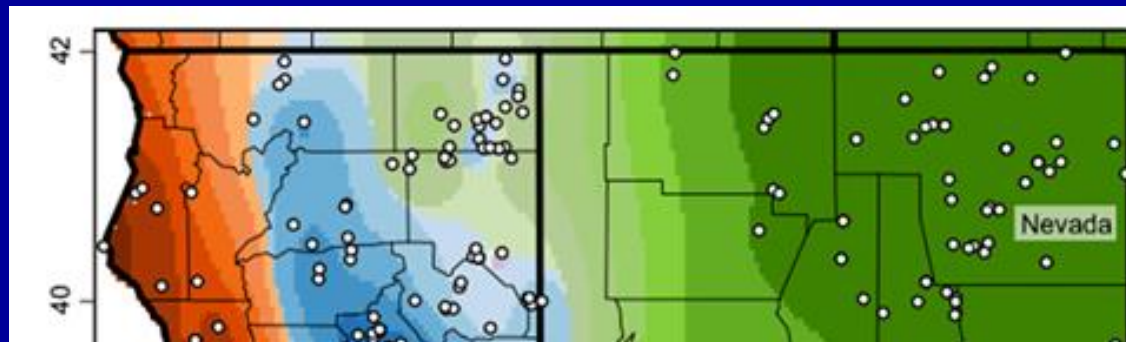
→ Dispersal event

# Overarching goals

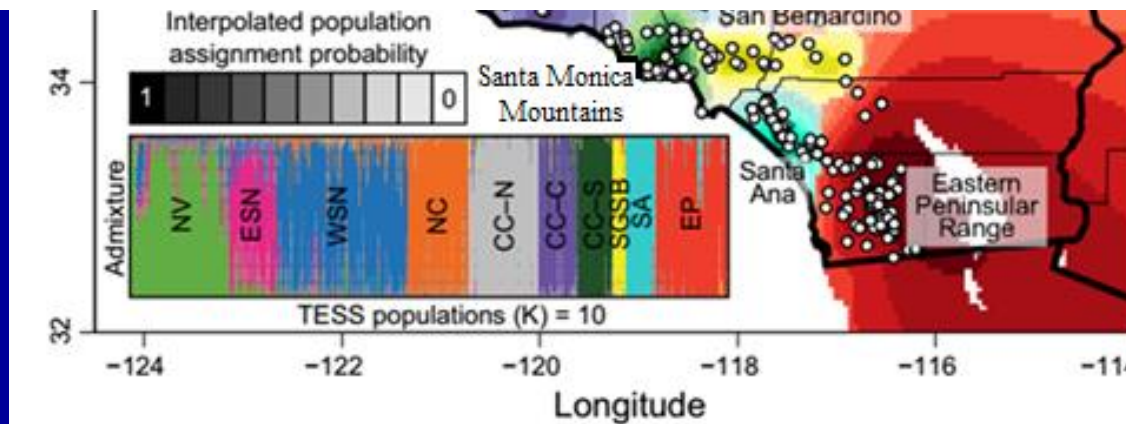
- Habitat vs genetics
- Protected habitat vs unprotected habitat

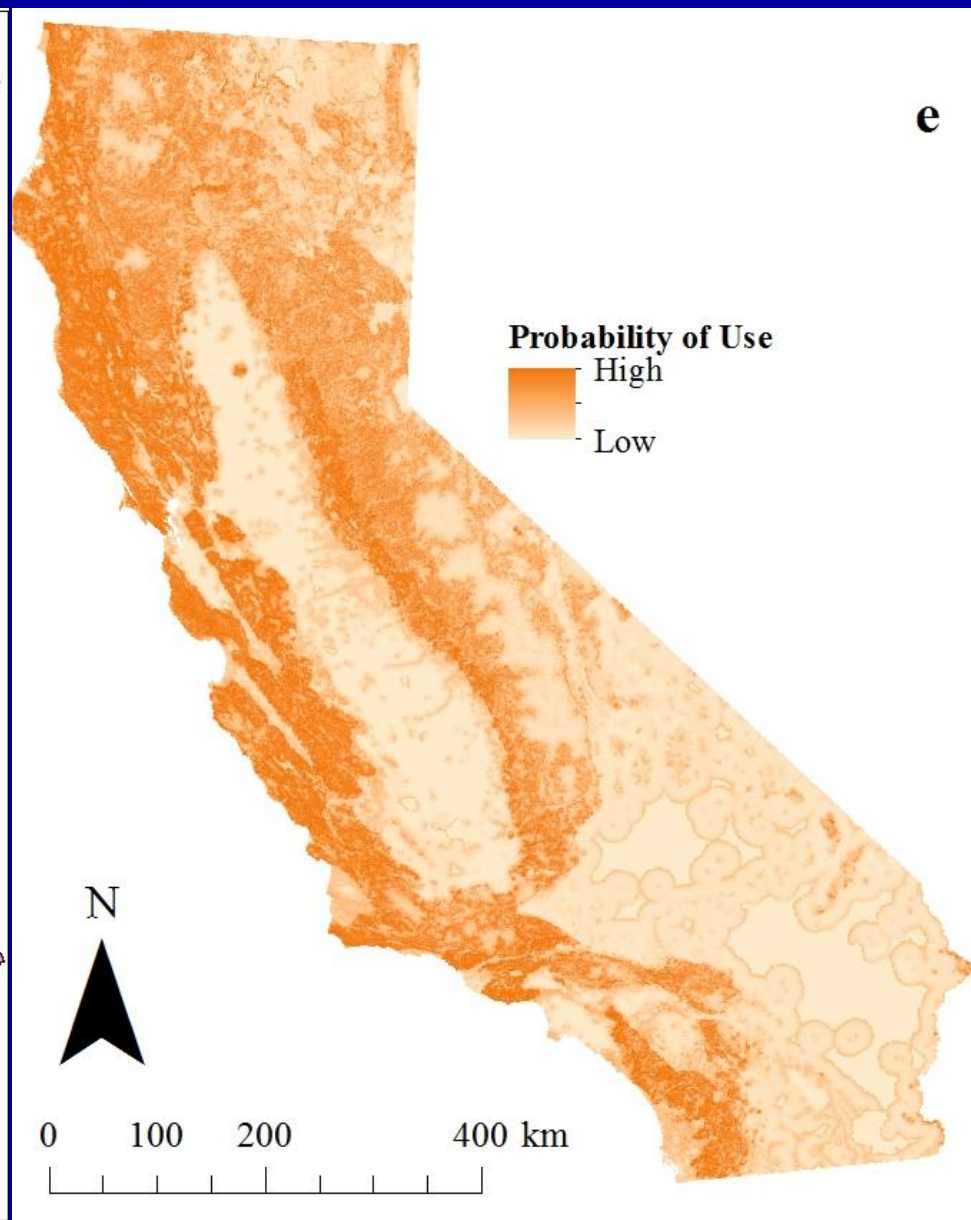
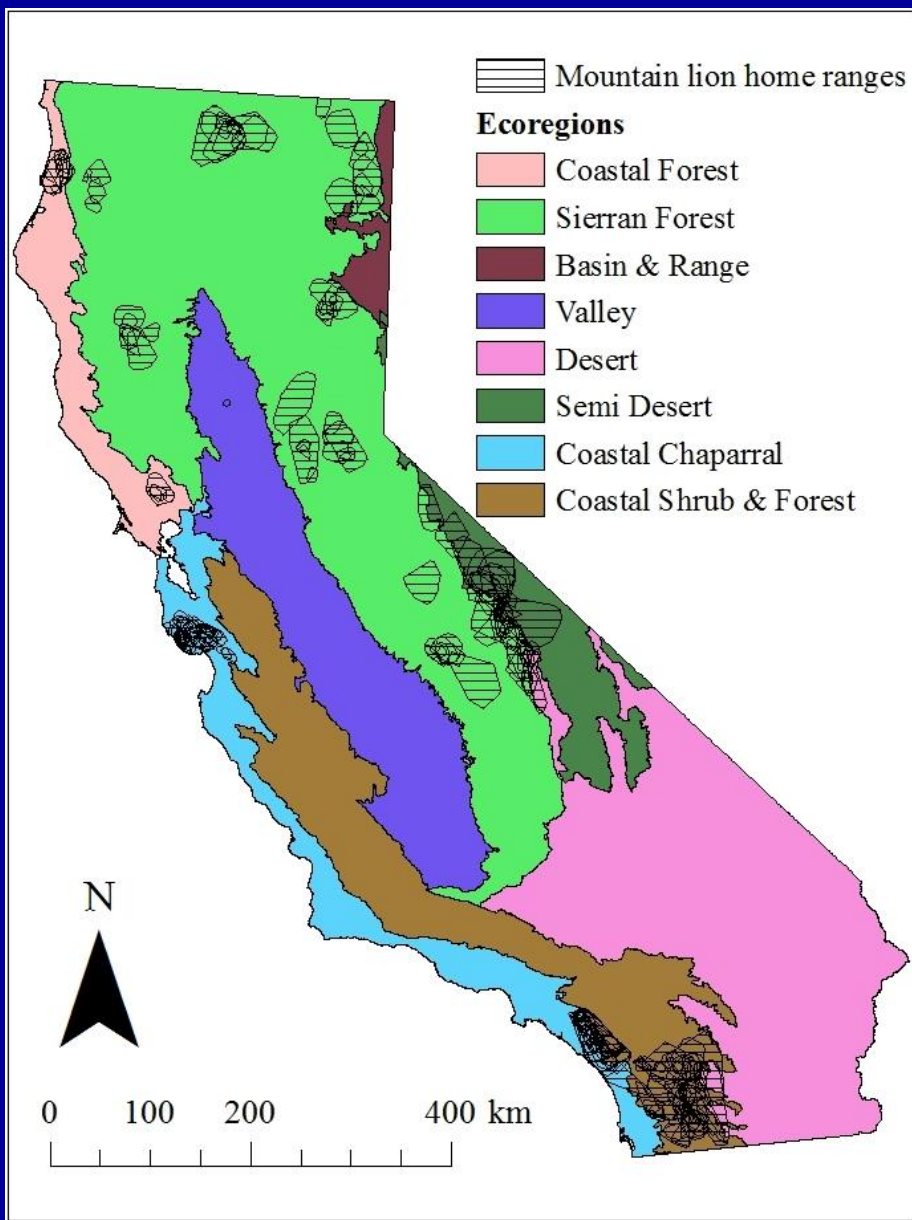




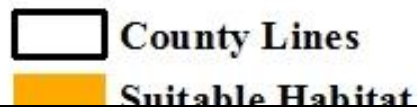
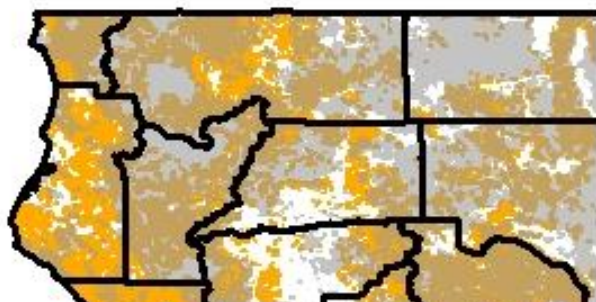


Area	Expected Heterozygosity	Internal Relatedness	Effective Population Size
Western Sierra-Nevada Mtns	0.52	0.09	156
Eastern Sierra Nevada Mtns	0.53	0.11	23
North Coast	0.41	0.28	83
Santa Cruz Mtns	0.42	0.27	17
Central Coast	0.46	0.19	57
Santa Monica Mtns	0.41	0.27	3
Santa Ana Mtns	0.33	0.39	16
Eastern Peninsular Range	0.44	0.21	32
San Gabriel and San Bernardino Mtns	0.42	0.29	5

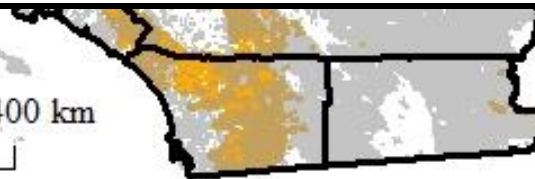
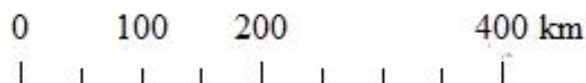








Area	Suitable Habitat (km <sup>2</sup> )	% Protected	Amount of Suitable Habitat (km <sup>2</sup> ) Protected
Western Sierra-Nevada Mtns	45,531	0.54	24,701
Eastern Sierra Nevada Mtns	9,677	0.98	9,443
North Coast	28,802	0.46	13,147
Santa Cruz Mtns	5,848	0.39	2,294
Central Coast	17,695	0.42	7,398
Santa Monica Mtns	2,644	0.43	1,149
Santa Ana Mtns	1,919	0.61	1,162
Eastern Peninsular Range	6,671	0.66	4,377
San Gabriel and San Bernardino Mtns	3,881	0.83	3,212



# Analyses

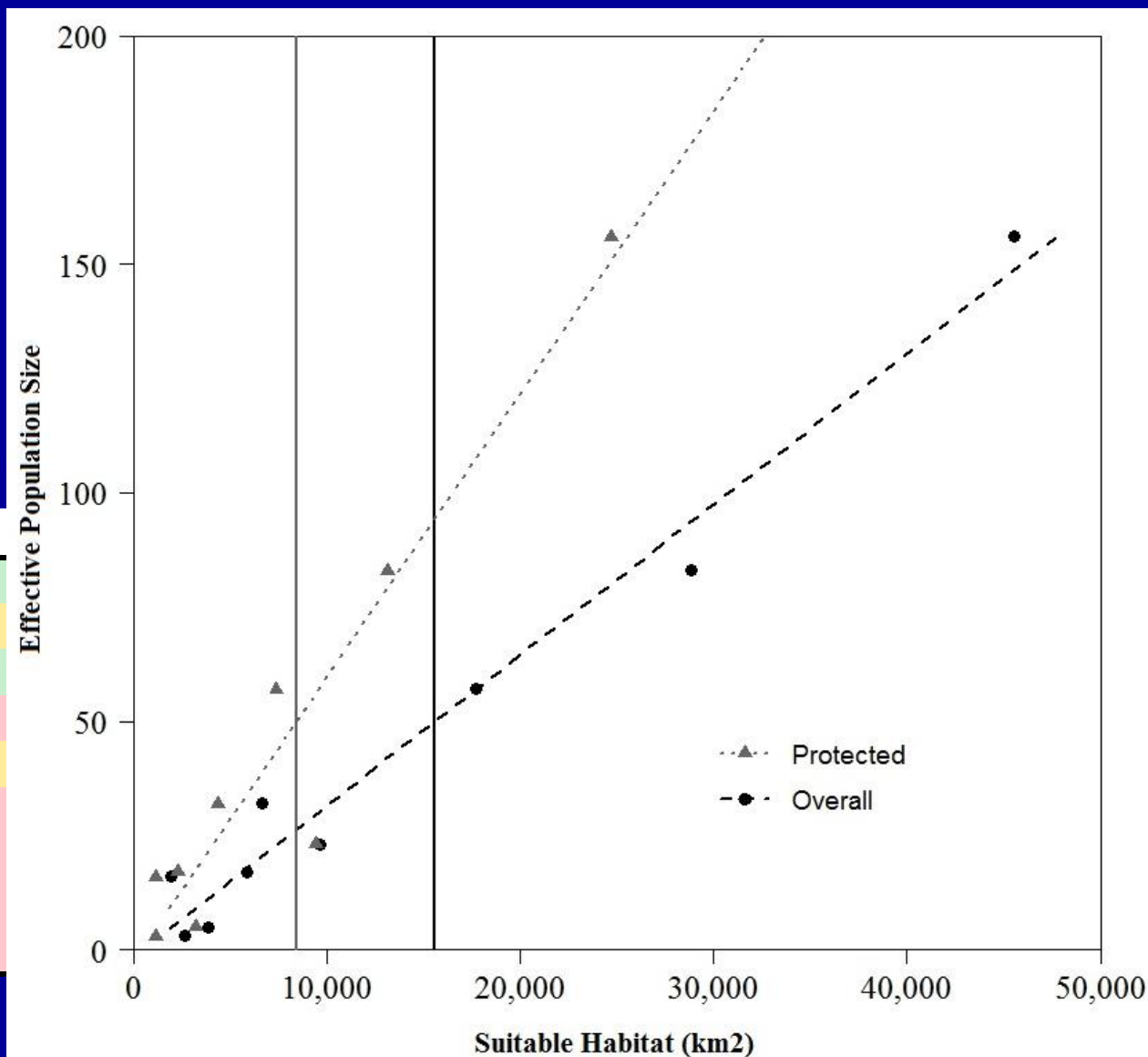
- Analyses
  - Effect. Pop. Size ~ Overall suitable habitat
  - Effect. Pop. Size ~ Protected suitable habitat
  - Minimum Threshold – Effect. Pop. Size  $n = 50$





# Results

	Effective Population Size	
	Overall	Protected
$R^2$ value	0.97	0.91
$p$ value	<0.001	<0.001
Minimum Threshold (km <sup>2</sup> )	15,600	8,450



## Area

Western Sierra-Nevada Mtns

Eastern Sierra Nevada Mtns

North Coast

Santa Cruz Mtns

Central Coast

Santa Monica Mtns

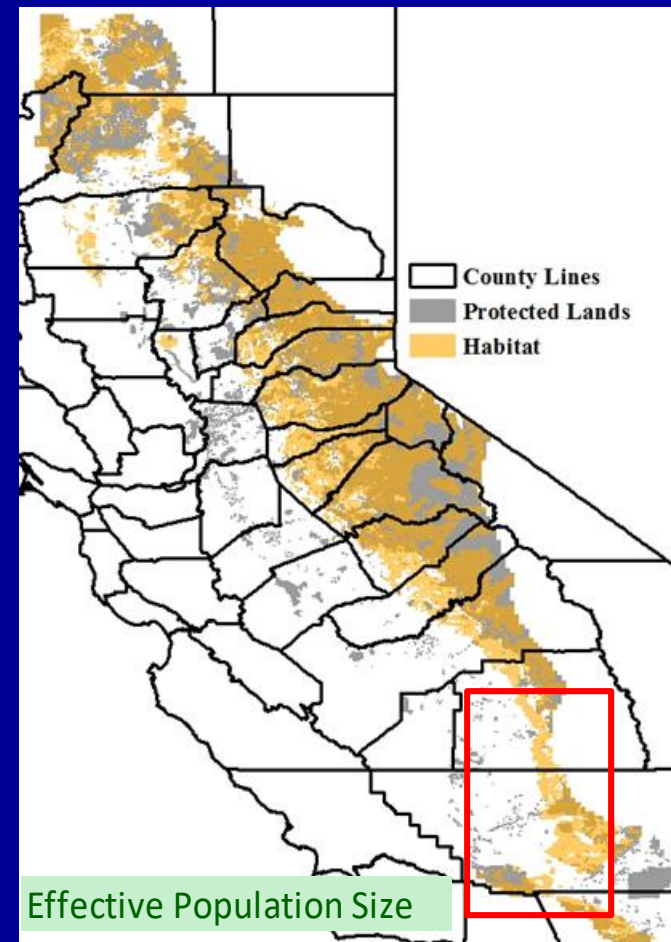
Santa Ana Mtns

Eastern Peninsular Range

San Gabriel and San Bernardino Mtns

# Western Sierra

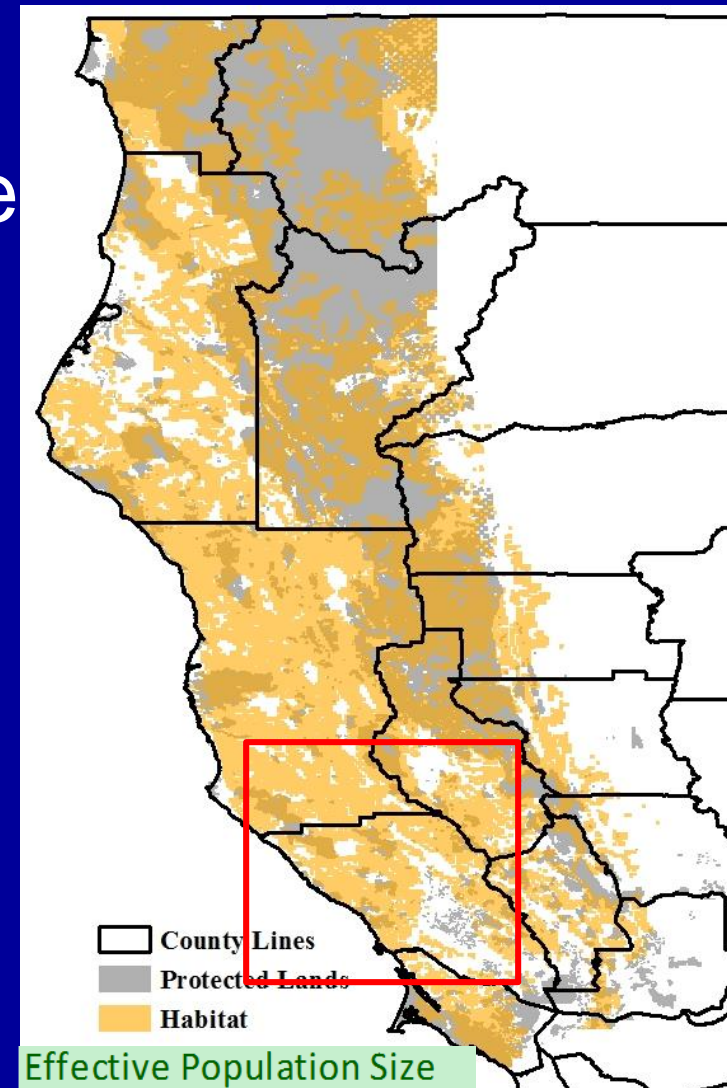
- No current concerns
- Important source for entire state & beyond
- Important to maintain habitat in southern extent





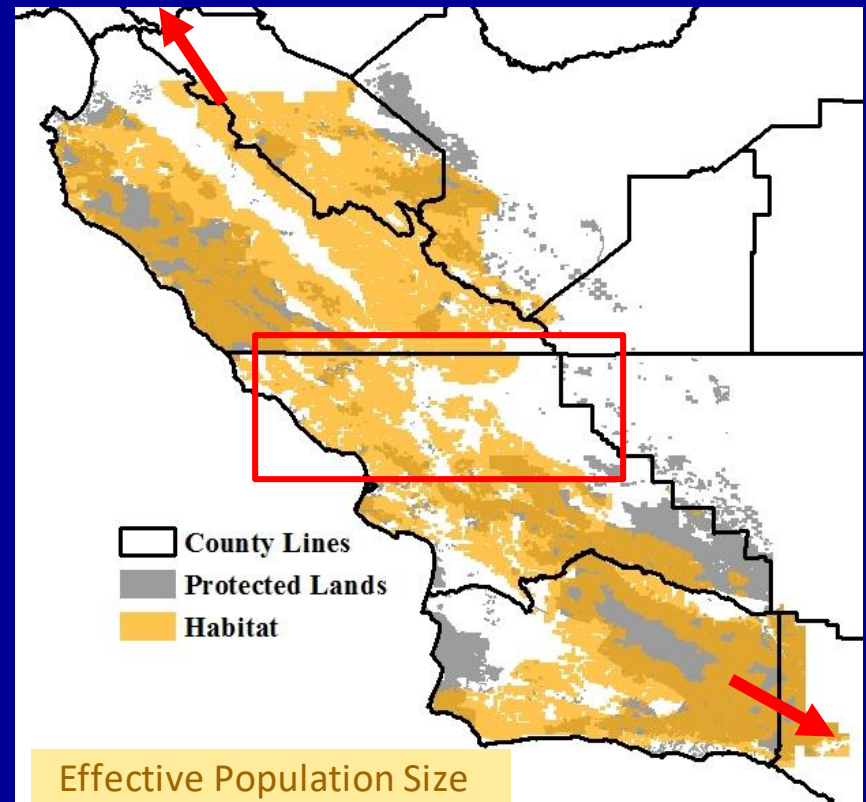
# North Coast

- No current concerns
- Southern extent a possible concern due to 'habitat peninsula' and little protected habitat



# Central Coast

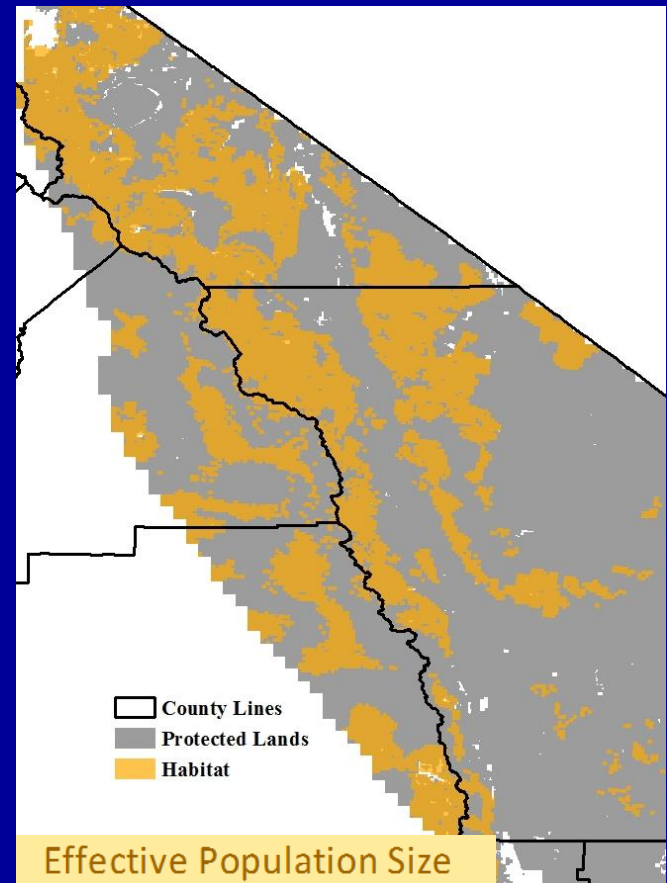
- No current concerns
- Increase protected habitat
- Central section is vulnerable
- Improve connectivity to smaller adjacent areas





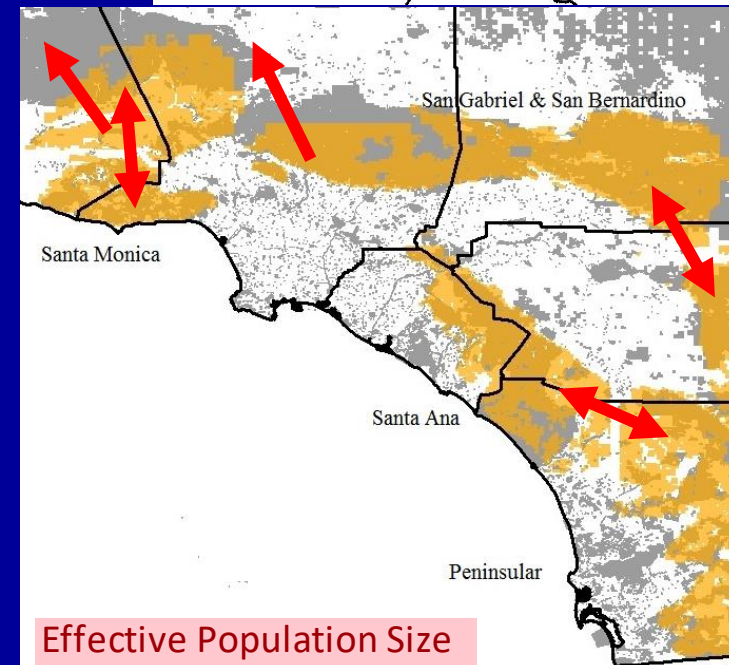
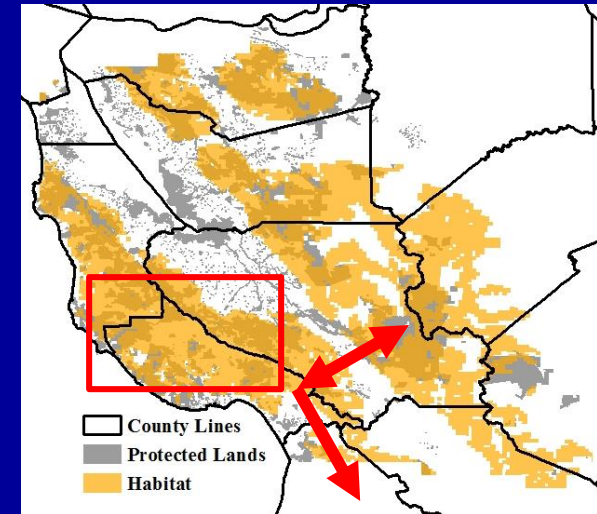
# Eastern Sierra

- Currently no concerns despite lower amount of habitat
- All habitat protected
- Maintenance of metapopulation dynamics likely promote persistence



# Santa Cruz & SoCal

- Current habitat/genetic concerns
- Internal habitat & connectivity at risk
- External connectivity limited
- Long-term viability of these areas a concern unless habitat protection & connectivity improved





# Summary

- Habitat predictor of genetic integrity
- Suitable habitat isn't as good as protected suitable habitat
- Regional habitat/genetic concerns in CA
- Improved habitat connectivity & protection = restored metapopulation dynamics = increased genetic integrity
- Ensuring habitat requirements for lions to persist ensures persistence of many other species (and ecological processes) too

# Path Forward?

- Conservation easements
- Open spaces
- Wildlife passage





# Thanks



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